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A GUIDE TO THE DEPARTMENT OF DEFENSE OPERATION, MAINTENANCE AND TRAINING ASSISTANCE PROGRAM (OMTAP) FOR WASTEWATER TREATMENT PLANT PERSONNEL

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OMTAP is a Department of Defense program to improve the performance of wastewater treatment plants located on military installations. The program is divided into three phases, each requiring a site visit by a team of evaluators.

The first phase involves a comprehensive evaluation of the treatment process to identify operational and/or design deficiencies. In the second phase, operators and laboratory technicians are trained on procedures recommended to overcome problems identified during the diagnostic phase. The final phase is a follow-on evaluation of plant performance to assess those improvements that have been made since OMTAP was initiated at the plant.

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A GUIDE TO THE

DEPARTMENT OF DEFENSE

OPERATION, MAINTENANCE AND TRAINING

ASSISTANCE PROGRAM (OMTAP)

FOR

WASTEWATER TREATMENT PLANT PERSONNEL

Prepared for:

Deputy Assistant Secretary of Defense for Environment

and

US Army, Facilities Engineering Support Agency

Prepared by:

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June 1987

DISCLAIMER

This report was prepared for the Office of the Deputy Assistant Secretary of Defense for Environment by V.J. Ciccone & Associates, Inc., under Contract DACA31-84-D-0044, and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Department of Defense.

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EXECUTIVE SUMMARY

OMTAP (Operation, Maintenance and Training Assistance Program) is a Department of Defense program formulated to improve the performance of wastewater treatment plants located on military installations. The program is divided into three phases, each requiring a plant visit by a team of evaluators for up to five days per visit.

The first phase involves a comprehensive evaluation of the treatment process to identify operational and/or design deficiencies. During this site visit, the OMTAP Team members tag valves and collect information needed to produce a draft of an operation and maintenance (O&M) manual for the plant.

The second phase requires a site visit to conduct training for operators and/or laboratory technicians on procedures recommended to overcome those problems identified during the diagnostic phase. This visit normally occurs six months after OMTAP is initiated at an installation. The team also uses this occasion to validate the content of the draft O&M manual and to examine operational problem areas in more depth.

The last phase, which normally begins 12 months after the initial site visit, is a follow-on evaluation of plant performance to assess those improvements that have been made since OMTAP was initiated at the plant. If needed, additional instruction or any other assistance that might benefit plant operators may be provided by the OMTAP Team.

The above process is described in detail in this document. In addition, the reader will find suggestions on how to implement OMTAP, covering such considerations as program management and funding, and the composition of the evaluation team. A sample statement of work is also included for those who elect to accomplish OMTAP by contract rather than by using "in-house" resources. For the convenience of all involved in the program, a detailed checklist of individual actions associated with each phase of the program is provided as an Attachment.

Documentation of each OMTAP phase involves the preparation of a report by the evaluation team. Suggested outlines for these reports are provided in Appendices to this document.

1.0 INTRODUCTION

1.1. BACKGROUND

This report is the culmination of one of several projects initiated by the Defense Environmental Leadership Project (DELP) to develop innovative solutions to long-term environmental problems and to improve the Department of Defense's national leadership position in environmental protection. It is presented by the Office of the Deputy Assistant Secretary of Defense for Environment, which is now responsible for the management of DELP-sponsored programs.

Several initiatives have already been undertaken by the Department of Defense in the area of water pollution abatement. One has been the execution of a Joint Resolution between the Secretary of Defense and the Administrator of the U.S. Environmental Protection Agency (EPA) outlining a cooperative program to enhance Chesapeake Bay pollution abatement activities. As part of this effort, the Department of Defense is taking definitive measures to ensure that effluent discharges into the Bay from military wastewater treatment facilities meet or exceed the water quality standards prescribed by state authorities for these facilities.

A more recent effort is the formulation of the Operation, Maintenance and Training Assistance Program (OMTAP) described in this report. The OMTAP's objective is to upgrade the effectiveness of all wastewater treatment plants throughout the Department of Defense, with emphasis to be given to those plants discharging directly and indirectly into Chesapeake Bay.

In addition to contributing to the Chesapeake Bay restoration effort, OMTAP is also designed to correct various deficiencies found during U.S. General Accounting Office (GAO) inspections conducted during 1982 at 13 selected DOD wastewater treatment plants.

In its report[1], GAO stated that 11 of these 13 plants investigated were discharging effluents that did not always meet prescribed standards. This condition, in certain instances, was attributable to deficiencies in plant design. However, in most cases, failure to consistently comply with the National Pollution Discharge Elimination System (NPDES) permit requirements was caused by shortcomings in plant operation and maintenance.

The OMTAP was formulated by the Office of the Deputy Assistant Secretary of Defense for Environment and is derived from the Operator Assistance Program (OAP) developed by the US Army Facilities Engineering Support Agency (USAFESA), Fort Belvoir, Virginia. Both OMTAP and OAP are based on the generic protocol for a comprehensive diagnostic evaluation of the management and operation of wastewater utilities, prepared by the US Environmental Protection Agency.[2] Modifications to EPA guidance and procedures have been made to account for differences between the management and operation of federally-owned and municipal facilities, and to ensure that "at-the-plant" assistance is provided where needed.

To validate and refine the initial OMTAP procedure, pilot tests were conducted at wastewater treatment plants at the Edgewood Area of Aberdeen Proving Ground, MD, and the Marine Corps Development and Education Command, Quantico, VA.

1.2 PURPOSE OF REPORT

This report describes the OMTAP procedure in detail for the benefit of potential users within DOD. The reader will find a discussion of key management considerations involved in planning the implementation of this program. There are also some suggestions on how

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[1] USGAO, "DOD Can Make Further Progress in Controlling Pollution From its Sewage Treatment Plants", GAO/NSIAD-84-5, Feb. 3, 1984. (Sewage treatment and wastewater treatment are considered synonymous in this document).

[2] USEPA, "Comprehensive Diagnostic Evaluation and Selected Management Issues", Office of Water Programs Operations, EPA-430/9-82-003, February 1982.

to avoid the types of difficulties encountered during the Army's Operator Assistance Program and the OMTAP pilot tests conducted at Edgewood and Quantico. This information is presented in a Chapter entitled: "Lessons Learned". Suggested outlines of the documents that would be prepared under OMTAP are provided in Appendices to this report.

2.0 OMTAP CONCEPT

2.1 GENERAL

2.1.1 Genesis of OMTAP

OMTAP is an expansion of the Operator Assistance Program (OAP) developed by US Army Facilities Engineering Support Agency (USAFESA) to improve the efficiency of Army wastewater treatment plants. OAP is conducted in three phases. First, a comprehensive evaluation of the treatment system is conducted to identify operational and/or design deficiencies. The second phase involves conducting on-site operator training on overcoming operational problems and provision of a plant-specific O&M Manual. The last phase is a follow-on reevaluation of treatment plant operations to assess what improvement in plant efficiency has been achieved.

2.1.2 DOD Requirements

The OMTAP addresses the following recommendations in the GAO report:

- "Direct and assist the services as necessary to provide more specific guidance to their bases on how to assure adequate plant operation and maintenance in order to be in compliance with (NPDES) permit requirements."

- "Require the Service Secretaries to establish some formal means of assuring that deficiencies identified at wastewater treatment plants are followed up and corrected in a timely manner."[1]

[1]USGAO, "DOD Can Make Further Progress in Controlling Pollution from its Sewage Treatment Plants", GAO/NSIAD-84-5, Feb. 5, 1984.

The key features incorporated into OMTAP to ensure that diagnosed deficiencies are "corrected in a timely manner" are (1) provisions for on-site operator and laboratory technician training and (2) a follow-up diagnostic visit to verify "compliance with permit requirements".

2.1.3 OMTAP Procedures

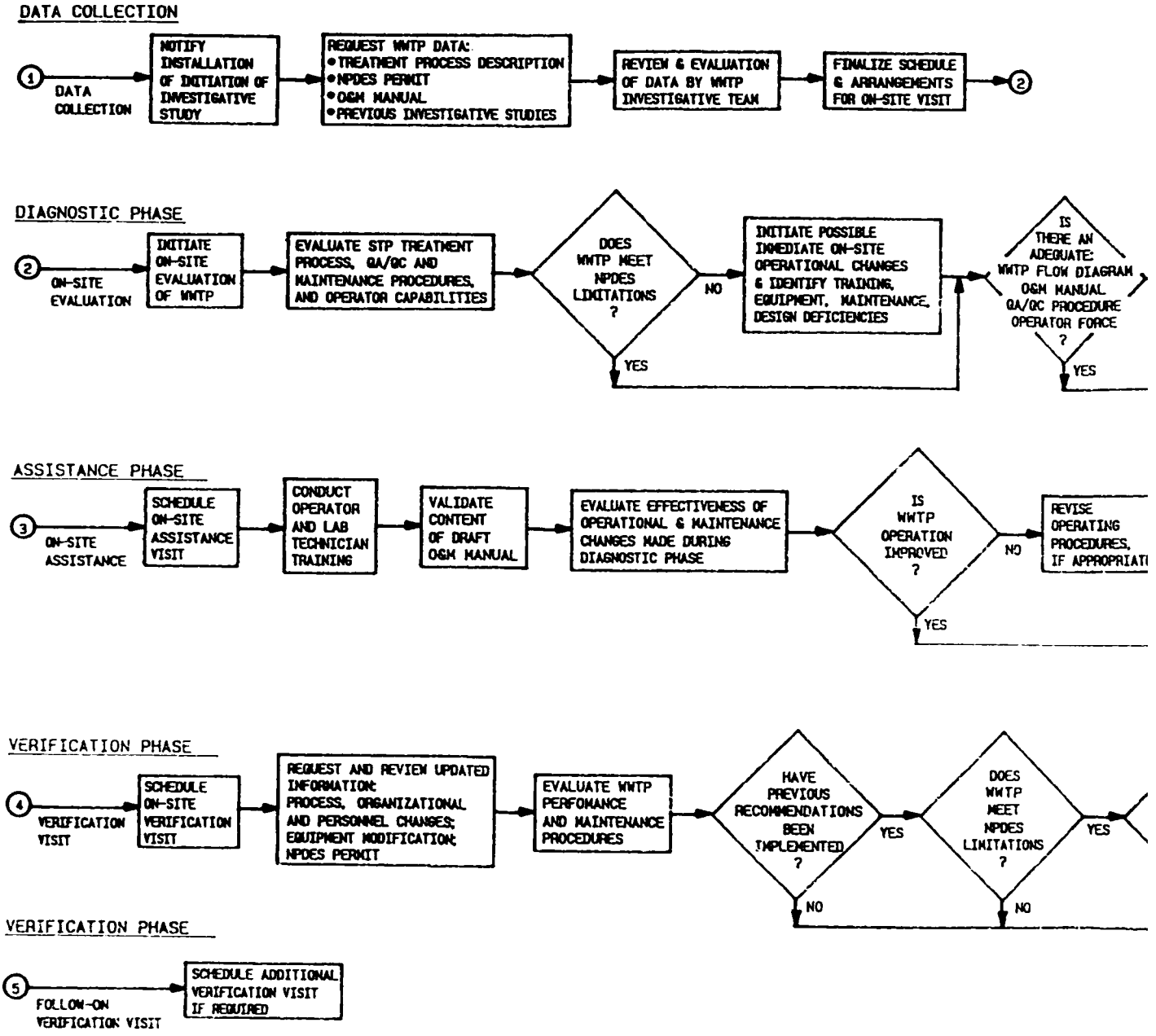
A work-flow diagram outlining the major steps and decision-points in the OMTAP procedure is presented in **Figure 2-1.** Details are discussed in the following paragraphs and cover each phase of OMTAP.

2.2 DATA COLLECTION

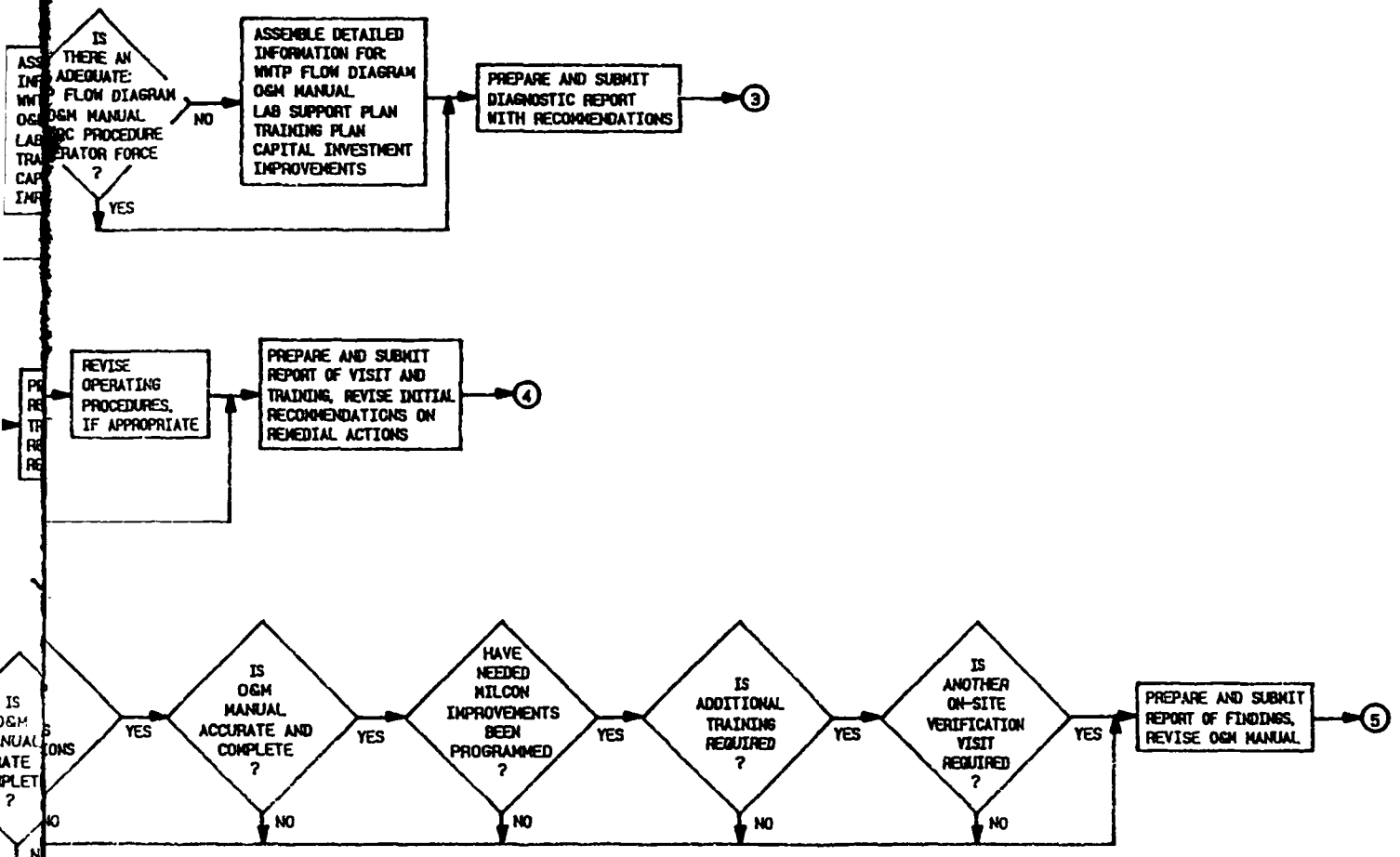
Once selected for OMTAP assistance, official notification of this decision, with proposed dates for the initial on-site visit, is forwarded to the Installation Commander and the appropriate official in the installation's engineering/environmental planning office. At the same time, a request is made for copies of selected documents describing the plant treatment process and a summary of recent performance. This information is required by the assigned assistance team to enable its members to become familiar with the treatment process and its past performance prior to the on-site visit. Typical information needed for this purpose includes:

- Process flow diagram(s) (if available)
- Operation and Maintenance (O&M) Manual (if available)
- Standing Operating Procedures (SOPs) (if available)
- NPDES permit (copy)
- EPA, State, DOD and any plant evaluation reports

Sufficient time should be provided for the assistance team to properly review these documents prior to the on-site visit. Under normal circumstance, about 3 to 4 weeks should be a reasonable amount of time for accomplishing the tasks described.


DATA COLLECTION
1
DATA COLLECTION
NOTIFY INSTALLATION OF INITIATION OF INVESTIGATIVE STUDY
REQUEST WWTP DATA:
• TREATMENT PROCESS DESCRIPTION
• NPDES PERMIT
• O&M MANUAL
• PREVIOUS INVESTIGATIVE STUDIES
REVIEW & EVALUATION OF DATA BY WWTP INVESTIGATIVE TEAM
FINALIZE SCHEDULE & ARRANGEMENTS FOR ON-SITE VISIT
2
DIAGNOSTIC PHASE
2
ON-SITE EVALUATION
INITIATE ON-SITE EVALUATION OF WWTP
EVALUATE STP TREATMENT PROCESS, QA/QC AND MAINTENANCE PROCEDURES, AND OPERATOR CAPABILITIES
DOES WWTP MEET NPDES LIMITATIONS ?
NO
YES
INITIATE POSSIBLE IMMEDIATE ON-SITE OPERATIONAL CHANGES & IDENTIFY TRAINING, EQUIPMENT, MAINTENANCE, DESIGN DEFICIENCIES
IS THERE AN ADEQUATE: WWTP FLOW DIAGRAM O&M MANUAL QA/QC PROCEDURE OPERATOR FORCE ?
YES
ASSISTANCE PHASE
3
ON-SITE ASSISTANCE
SCHEDULE ON-SITE ASSISTANCE VISIT
CONDUCT OPERATOR AND LAB TECHNICIAN TRAINING
VALIDATE CONTENT OF DRAFT O&M MANUAL
EVALUATE EFFECTIVENESS OF OPERATIONAL & MAINTENANCE CHANGES MADE DURING DIAGNOSTIC PHASE
IS WWTP OPERATION IMPROVED ?
NO
YES
REVISE OPERATING PROCEDURES, IF APPROPRIATI
VERIFICATION PHASE
4
VERIFICATION VISIT
SCHEDULE ON-SITE VERIFICATION VISIT
REQUEST AND REVIEW UPDATED INFORMATION: PROCESS, ORGANIZATIONAL AND PERSONNEL CHANGES; EQUIPMENT MODIFICATION; NPDES PERMIT
EVALUATE WWTP PERFOMANCE AND MAINTENANCE PROCEDURES
HAVE PREVIOUS RECOMMENDATIONS BEEN IMPLEMENTED ?
YES
NO
DOES WWTP MEET NPDES LIMITATIONS ?
YES
NO
VERIFICATION PHASE
5
FOLLOW-ON VERIFICATION VISIT
SCHEDULE ADDITIONAL VERIFICATION VISIT IF REQUIRED

ROCEDURE



OMTAP PROCEDURE

Figure 2-1

2.3 DIAGNOSTIC PHASE

The primary objective of the Diagnostic Phase (on-site investigation) is to determine if the wastewater treatment plant (WWTP) operation consistently produces effluent that is in compliance with the current NPDES permit and if it does not, the reasons why not. To accomplish this objective, the assistance team must observe and evaluate the effectiveness of each step in the treatment process and the treatment system as a whole. The team also needs to examine plant records and Discharge Monitoring Reports (DMRs) submitted to USEPA/State Regulatory Agencies covering the previous 12 months of operation in order to evaluate plant performance against NPDES permit requirements. Usually, 5 days are required to conduct a comprehensive on-site diagnostic evaluation of a typical military wastewater treatment plant.

Even if the plant is found to be in compliance with prescribed standards, it is essential that the investigation be pursued for the purpose of uncovering potential problem areas that could adversely affect plant performance in the future, or identifying measures and means that could improve plant efficiency. Typical areas and critical aspects of an operating plant that should be examined in detail are listed below. A more complete listing is in the OMTAP checklist found in the Attachment to Appendix V.

- Supervisory and Operational Personnel
  - staffing (required vs actual vs authorized)
  - operator training and certification
  - promotion opportunities and morale
- Documentation
  - accuracy of operation and maintenance records and reports
  - accurate and usable Operation and Maintenance (O&M) Manual
  - availability of equipment manufacturer's literature
  - plans and specifications of as-built unit processes

- Plant Operation

  - comparison of design and actual hydraulic flows
  - contaminant removal efficiency for each unit process
  - wastewater sampling and verification testing, if required

- Laboratory Support

  - adequacy of laboratory physical facilities
  - adequacy of equipment and supplies
  - accuracy of sampling and test procedures
  - proper utilization of test results to adjust/control treatment processes
  - availability of Quality Assurance/Quality Control (QA/QC) and laboratory Standing Operating Procedure (SOP) documents

- Maintenance

  - proper housekeeping
  - purposeful maintenance program and schedule
  - accuracy of maintenance records and files

- Supply and Procurement

  - adequate chemical storage facilities and stockage levels
  - adequate lead time for purchase of critical chemicals
  - sufficient spare parts inventory

- Safety

  - viable safety program
  - adequate fire safety plan
  - availability of self-contained breathing apparatus and masks

- Health/Morale

  - annual physical examinations
  - sanitary eating facilities
  - individual lockers for plant personnel
  - adequate lavatory facilities
  - laundry facilities (washer and dryer)

Whenever a treatment plant is found "not in compliance" with NPDES permit provisions, attention should immediately be directed to operating procedures, equipment capacities, and even design considerations in order to identify those deficiencies causing failure to meet effluent discharge limitations. For this effort, it may be necessary that the assistance team measure flows, verify pump discharge volumes, collect samples, perform laboratory analyses, etc. In these situations, the team may need access to diagnostic equipment and resources not normally available at the treatment plant.

Relatively simple and low cost measures (e.g., less than $2,500) that can be taken quickly to improve plant performance should be reported to the appropriate installation official for early implementation. If possible, changes should be implemented and observed at the time of this visit to enable the assistance team to witness and evaluate the effectiveness of their recommendations prior to departure.

By the time the evaluation is completed, the team should have collected sufficient detailed information to accomplish the following:

1) Prepare a report of the field investigation with appropriate findings and recommendations.

2) Produce a plant schematic or plant flow diagram.

3) Produce or upgrade an O&M Manual.

4) Prepare a Program of Instruction for subsequent on-site training sessions.

5) Prepare a one-page summary sheet detailing key observations and recommendations which should be left at the exit briefing.

A suggested outline for the Diagnostic Phase Report is presented in Appendix I. Also included is a set of sample Diagnostic Evaluation forms (Attachment 1 to Appendix I) which can serve two useful purposes:

1) Convenient data recording sheets during the on-site evaluation work, and

2) When completed, a detailed summary of a plant which could be attached as an appendix to the Diagnostic Phase Report, if considered appropriate.

2.4 ASSISTANCE PHASE

Once the diagnostic report has been submitted for review by the staff at the installation, a return visit is made to the wastewater treatment plant. About 90-120 days should be allotted to review the report and for the installation staff to implement recommended operational changes. This return visit by the assistance team has several specific purposes:

- Conduct operator/laboratory technician training.
- Validate the contents of the draft O&M Manual.
- Evaluate the effectiveness of any changes in the operation and maintenance of the plant since the on-site diagnostic evaluation.
- Revise previously recommended operational changes intended to upgrade plant performance, if necessary.

Training classes for operators and laboratory technicians should be oriented primarily to correcting those deficiencies observed during the Diagnostic Phase. The topics for each class period need to be carefully selected, introduced to the operators using a conference/open discussion class format or one-on-one discussions followed by an actual hands-on practical exercise, where individuals are given an opportunity to perform each recommended procedure. Instruction for laboratory technicians preferably should be on a one-on-one basis at the bench to ensure proper understanding of laboratory techniques.

The benefits from using the above training techniques are much greater than from presenting a formal curriculum on wastewater treatment similar to that presented by schools offering operator certification courses. However, consideration should be given to supplementing on-site training with a self-study course on the principles of wastewater treatment. A set of simplified texts that can be used by both operators and laboratory technicians during on-duty spare time are:

Operation of Wastewater Treatment Plants,[2]
"A Field Study Training Program"
Volumes I, II and III (1983)
U.S. Environmental Protection Agency
Office of Water Programs
Division of Manpower and Training

The best text for on-site training classes is the draft O&M Manual prepared specifically for the WWTP under evaluation. The manual should be a completed draft and made available to the operators by the start of the Assistance Phase. Availability of the manual during the Assistance Phase also provides an opportunity to validate it for completeness, clarity and accuracy. A typical outline of an O&M Manual is reflected in the sample attached as Appendix II. This outline has been derived from guidelines published by the US Environmental Protection Agency.[3]

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[2] Order From: Project Director, Operation of Wastewater Treatment Plants; California State University Sacramento; 6000 J Street; Sacramento, CA 95819; Telephone: 916-454-6142.

[3] Considerations for Preparation of Operation and Maintenance Manuals, EPA-430/4-74-001, USEPA, Office of Water Program Operations, Washington, D.C.

Another training mechanism that can be used to aid operator and laboratory technician understanding is a "Student Workbook". Essentially, the Workbook is an outline of the topics to be covered in training classes, but formatted to permit the trainee to enter notes under each entry. Supplementary instructions not included in the O&M Manual may be included to provide a better understanding of any special subject under consideration.

At the conclusion of the training, a true/false or multiple choice answer quiz should be administered to enable the instructor to evaluate student understanding. This quiz should be scored in order to identify those persons successfully completing the training and thereby eligible to have an appropriate entry made to their personnel or training record.

Upon completion of the training, attendees should be given the opportunity to complete a critique sheet to express their views about the value and effectiveness of the training. In addition, the OMTAP Team should prepare a written summary of their findings from this visit, discuss those matters of primary interest during the exit interview and furnish a copy of the summary to those management-level personnel who are present.

The Assistance Phase Report is primarily a summary of the assistance given during the site visit. It should also contain information on changes that may have been made at the plant since the Diagnostic Phase site visit. A suggested outline of this report is provided in Appendix III.

Validation of the O&M Manual involves a review by the plant foreman and other installation staff who are competent to assess the accuracy and clarity of technical subject matter. Changes to the manual may be needed to reflect revised procedures arising from the earlier site-visit for the Diagnostic Phase. Other changes may be necessary at a later date (e.g., Verification Phase), particularly if capital expenditures for new facilities or equipment are programmed.

The Assistance Phase visit also provides an opportunity to assess improvements in plant operations resulting from previously recommended changes in operating procedures. The assistance team may also recommend revised or new operational procedures at this time. Should this occur, such recommendations should be included in the Assistance Phase report.

Proper performance of tasks in this phase of OMTAP requires a team of at least two experienced engineers/technicians. At military installations with more than one wastewater plant, additional team members may be required if the one-on-one training method is to be employed. Generally, 4 to 5 days should be allotted for the work.

2.5 VERIFICATION PHASE

The Verification Phase involves one or more return site visits to a WWTP to ascertain what improvement in plant operation has resulted from prior visits and what additional assistance may need to be provided. At least one verification visit should be programmed, and it should be scheduled no more than 12 months after completion of the Assistance Phase. This time interval is usually needed to enable previously recommended operational and equipment changes to be completed and to give enough time for the changes to have an effect on the treatment process.

The assistance team assigned to the Verification Phase should re-examine the total spectrum of plant operations, using essentially the same checklist as for the Diagnostic Phase. Primary attention should be directed to determining if the plant consistently produced effluent that was in compliance with NPDES permit limitations during the intervening months.

In addition, the status of actions taken to implement those recommendations made as a result of previous visits should be evaluated. Particular attention should be given to what actions have been taken to correct deficiencies noted in maintenance, safety, and supply procurement, as well as in the other areas mentioned in Paragraph 2.3.

Another matter that may be included as part of the verification visit agenda is revalidation of the O&M Manual. This becomes important if operational or equipment changes have been made since the last visit but have not been documented.

The possibility that additional or refresher training is needed should definitely not be overlooked. It is appropriate to query those responsible for the operation of the plant as to their training needs and desires. On the other hand, the assistance team should use the visit to independently assess the proficiency of plant operators and the need for refresher training.

At those plants where significant changes were made to treatment processes since the last inspection, it would be appropriate to request updated WWTP information for review prior to an on-site visit. In any event, it is considered prudent that the assistance team become fully familiar with previous reports and correspondence in the OMTAP file before the site visit so that time spent on-site can be fully productive.

Circumstances at an individual WWTP will dictate how many verification visits should be scheduled. Those plants with a history of difficulty in meeting compliance standards should logically be checked several times and assistance provided as required. Other reasons for scheduling more than one verification visit to a plant are:

- Issuance of a new/revised NPDES permit.
- Completion of capital improvement required because of system design changes.
- Significant turnover in operator personnel; new employees will require training.
- Installation of new equipment for which special operator training is needed.

Verification Phase visits can usually be conducted by a one or two person team on-site for 3 to 5 days, depending on whether there is a need to conduct additional training.

As with the other phases of OMTAP, a report is to be provided upon completion of the Verification Phase on-site visit. A suggested outline for this report is provided in Appendix IV. This report not only discusses the OMTAP Team activities and findings specific to the Verification Phase, but also provides a brief summary of the two previous phases and an assessment of the overall benefits realized from conducting OMTAP at that particular installation.

3.0 OMTAP IMPLEMENTATION

3.1 GENERAL

Each military service must address several important management issues prior to implementing the OMTAP procedures discussed in Chapter 2.0. These issues are summed up in the following questions.

- What agency will be assigned and given the management responsibility for the OMTAP?
- What agency will fund the OMTAP?
- Which personnel will perform the on-site investigations and training, and prepare the documentation?
- What is the scope of work?

To help answer the above questions, a brief discussion of these and other management considerations is provided in this chapter.

3.2 PROGRAM MANAGEMENT

Management of the OMTAP can be accomplished in various ways. The two most obvious are "centralized and decentralized" management. Both methods are workable. However, in view of GAO and congressional emphasis on improving WWTP compliance with regulatory requirements, centralized management at a major command level is preferred because it offers the following advantages:

- Status of on-site investigations and overall improvement in WWTP performance can be quickly determined and reported.
- Priority attention and resources can be more readily directed to those WWTPs with the most serious problems.
- Service-wide trends and problems can be more readily diagnosed.

- Use of more uniform standards for on-site investigations, reports and training programs are more readily effected.

- Military construction programmers can be easily and quickly alerted to anticipated needs for new WWTP facilities or major improvements.

- Facilitates reporting information about the program on relatively short notice to the GAO and/or the Congress.

Centralized management also has disadvantages. The most significant are:

- Difficulties are inherent in a program office obtaining timely feeder information through a chain of command.

- Time delays are common when problems are referred to a single office for resolution.

- Directing the flow of documentation down the chain of command to the appropriate official is not always accomplished in a timely manner nor is the correct official always identified to receive the documentation.

Decentralized management likewise has advantages and disadvantages. The advantages include:

- Segments of a major program are smaller than the whole and are, therefore, more often easily managed.

- Problem areas tend to be identified and resolved more quickly.

The principal disadvantages are:

- Program often lacks uniformity when several managers are involved.

- More effort and time is usually required to obtain accurate information on the status of the overall program.

3.3 FUNDING CONSIDERATIONS

Funding for OMTAP can be handled in the same way as program management - it may be centralized or decentralized. "Centralized" involves block funding for the entire program; "decentralized" funding requires that subordinate commands provide their own funds.

Centralized funding for OMTAP may not be convenient for all services, particularly if the program needs to be implemented without delay. It does, however, offer these distinct advantages:

- Funds can be readily and directly allocated for work at those plants with the most serious problems.

- Work priorities and funding can be more readily aligned.

- Costs can be better controlled by limiting funding for only specific tasks, as set forth in a scope of work.

- Delays in initiating the program can usually be avoided when assured funding is available.

Centralized funding is generally more desirable because it avoids the need to realign funds at the base level. Nevertheless, there are certain disadvantages, such as:

- Time delays and approval difficulties associated with obtaining necessary funding.

- Work cannot be started until the whole program is authorized and funded, despite any urgency to initiate work.

Decentralized funding is sometimes used when a new program, such as OMTAP, is implemented service-wide. The reasons for this are:

- The cost of the program can be distributed among agencies.
- Program implementation is generally expedited.

The key disadvantage of this procedure are:

- Uniform implementation of a program is usually not achieved.
- Funds are normally obtained by reprogramming from other projects/programs.

3.4 CONTRACT OPERATED FACILITIES

Wastewater treatment plants at many bases are now operated by contractors who are required to provide qualified operators, maintenance personnel and laboratory technicians. At these plants slight modification of the OMTAP should be considered. Specifically, on-site training, normally provided during the Assistance Phase, should be deleted since the operating contractor has responsibility for providing skilled operators and maintenance personnel.

During the Diagnostic and Verification Phases, the capabilities of contractor personnel should be evaluated by the OMTAP assistance team. Any major deficiencies observed that adversely affect operation of the plant should then be reported to the contracting officer at the base for necessary action.

3.5 PROGRAM EXECUTION

The OMTAP can be performed either by contract or by forming a select team from in-house resources. Regardless of the choice made, investigators making plant visits should be either technicians, who have

previous experience in operating wastewater treatment plants, or engineers with extensive field experience; preferably, both technicians and engineers should be made available and assigned to this effort. These types of backgrounds are needed to "talk the language of the wastewater treatment plant operator" and to be able to diagnose operational, maintenance and safety problems. Engineering assistance would most likely be needed whenever it is necessary to check the design of an existing plant unit or to develop detailed recommendations for new equipment or plant modifications. In most instances, however, there is a limited requirement for design capability. The greatest need is for personnel intimately familiar with "hands-on" skills of an operator and a qualified laboratory technician. These qualifications are especially important during the Assistance Phase when training is provided. Plant operators undergoing training will more readily accept help from an instructor who has a background and experience similar to theirs rather than from someone with primarily engineering or management experience.

When planning to implement OMTAP, provisions should be made to have the same team members available for both the Diagnostic and Assistance Phase at an individual installation. This is essential to provide continuity and achieve maximum benefit from OMTAP. Furthermore, each team should be scheduled to evaluate a series of plants. Investigators need to develop sufficient experience to effectively conduct a diagnostic evaluation in a relatively short period of time. Only after completing a series of plant evaluations does a team become experienced and better able to uncover operational problems quickly and to suggest remedial measures to correct them.

A successful OMTAP using in-service resources, requires that two factors be addressed. The first is to verify the availability of qualified evaluators for the required period of time. The second is setting a time limit for completing OMTAP, or, at least, completing the first three phases. An analysis of these two factors will essentially determine whether the work should be done "in-house" or by support contract.

3.6 SCOPE OF WORK

A suggested statement of work (SOW) for OMTAP is provided in Appendix V. It is applicable to execution by "in-house" or "contractor" resources. This SOW encompasses those key steps in the OMTAP procedure identified in **Figure 2-1** and discussed in Chapter 2.0. The Attachment to Appendix V is a checklist for each phase of OMTAP, where the key actions and documents identified in each phase are grouped according to whether they are pre-visit, on-site or post-visit requirements.

4.0 LESSONS LEARNED

4.1 GENERAL

This section contains a summary of "lessons learned" from the US Army OAP[1] and from pilot testing the OMTAP procedures at the WWTPs located in the Edgewood Area of Aberdeen Proving Ground and at the Marine Corps Development and Education Command, Quantico, VA. These lessons are arranged in three groupings - (1) General Observations, (2) Program Administration, and (3) Operational and Maintenance Problems. For each of the problem areas, suggestions are offered to overcome those difficulties found most troublesome.

4.2 GENERAL OBSERVATIONS

4.2.1 Low Morale

A state of low morale is usually reflected in both the appearance and performance of a wastewater treatment plant. Although many factors induce this condition, the principal cause is the lack of support and interest on the part of management. It is not uncommon for interest in the plant to be shown only when there is a serious problem, such as the threat of action by a regulatory agency. Conditions that are conducive to low morale include:

- There is often inadequate leadership. Some plants operate without a full-time plant foreman (e.g., the foreman may be located at the water plant and spend only a few hours per day at the wastewater treatment plant). Also, evening shifts are worked where there is no plant foreman or designated supervisor in charge.

- Lack of feedback from supervisors. Many operators complain that suggestions or complaints about working conditions are ignored or are lost somewhere in the chain of command.

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[1] US Army FESA Report E-86021 and E-87006, "Wastewater Treatment Operator Assistance Program Lessons Learned", November 1985 and December 1986, respectively.

Suggested Action: Measures that can be taken to improve morale at minimal cost are:

- Initiate and implement an operator suggestion program.
- Provide and make readily available to the operators periodicals on wastewater treatment and self-study training courses.
- Schedule monthly meetings between operations, maintenance, laboratory personnel, and the plant supervisor.
- Schedule bimonthly meetings between operating personnel and Utilities/Environmental Office personnel to exchange ideas and to explain recent policy decisions and proposed actions that could affect plant personnel.
- Designate a training coordinator; develop and implement a training plan for each operator.
- Provide sanitary eating and locker room facilities for personnel.

4.2.2 Inadequate Safety Program

Military wastewater treatment plants encounter many of the same problems as municipal plants. When money and manpower are short, safety is one of the first items to be neglected. Common safety problems at wastewater plants include the lack of a formal safety program, no regularly scheduled safety meetings, no call-in system for single shift operators, no eyewash or showers in the laboratory, and a general failure to "think safety" at all times.

When funds are limited and personnel are reduced, the most likely positions to be cut are in two-person crews. Lift stations formerly serviced by two operators are commonly serviced by one employee. Two person night shifts are often reduced to single person shifts. Furthermore,

many of these short-handed shifts operate without the benefit of a "call-in system" to the Fire Department or other all-night activity.

Suggested Action: The following measures should be taken to enhance safety at WWTPs:

- Require a formal safety program be developed and implemented.
- Insist on regularly scheduled safety meetings.
- Schedule periodic safety inspections.
- Establish a "call-in" procedure and make implementation mandatory for any shift having only one operator.

4.2.3 Insufficient Laboratory Testing

Every wastewater treatment plant must conduct laboratory analyses to comply with the operating permit. However, basic tests required by regulatory agencies do not provide enough information to effectively operate a treatment plant. They sometimes provide information on what is going into the plant and always on what is coming out, but do not provide information about what is going on within the treatment plant, i.e., efficiencies of unit processes.

Suggested Action: To effectively evaluate a wastewater plant, laboratory tests need to be performed on samples collected from intermediate points throughout the plant, and not just from the plant influent and effluent streams. To identify specific problem areas within a plant, periodic sampling and testing must be conducted at the influent and effluent of individual unit processes. The frequency of these tests will depend on the condition of wastewater influent.

As a rule, the testing requirement will be greatest when process control is first initiated, and then it can be reduced to a series of periodic check-tests. This will normally mean a slight increase in workload at the plant and additional expenditures for equipment and laboratory chemicals.

Neither of these expenses should be a major problem for an installation except for those locations where sampling and testing is provided by contract. In any event, the additional data will enable operators to optimize plant performance and to reduce operating costs particularly at plants relying on chemical treatment.

4.2.4 Poor Transfer of Data from the Laboratory to Operators

Many military plants do not perform as well as they should because operators do not receive test results from the laboratory in a timely manner. Although many wastewater plants have excellent laboratory facilities with competent personnel to produce good laboratory data, there is often no mechanism for communicating the data from the laboratory to the operators. As a result, some of the effort put into collecting and analyzing wastewater samples is wasted, or at best ineffective.

Suggested Action: Laboratory results needed for process control should be communicated on a routine basis to the operators by the most convenient method. An effective method of presenting test results is to enter them in the plant operating log. This time-sensitive data should be made available to all operators as quickly as possible. Other procedures can be used, such as writing the data on a chalkboard or entering them on a special form designed for this purpose.

4.3 OMTAP PROGRAM ADMINISTRATION

4.3.1 Lack of Background Information

Installations often respond slowly, if at all, to requests for the background information needed by an assistance team prior to an on-site diagnostic visit. The lack of this information results in team members spending valuable on-site time to become oriented and familiar with the various plant processes.

Suggested Action: Requests to an installation for information should be transmitted as early as possible, contain a suspense date and be sent through command channels. Also, the highest ranking authority

possible should sign the request to encourage prompt response from the installation. A timely telephonic follow-up request should also be made to ensure the requested materials are received before a site visit is made.

4.3.2 Poor Entrance Interviews

Despite efforts to coordinate the initial on-site visit, installation personnel are often not prepared and sometimes are not even available for an entrance interview at the time agreed upon. As a result, much valuable time can be wasted by the team.

Suggested Action: Telephonic confirmation that arrangements have been made for the entrance interview should be made 24 hours prior to the appointment.

4.3.3 Rescheduled Visits

Installation representatives have requested site visits be rescheduled, often at the last minute.

Suggested Action: Postponement of site visits should not be permitted except for extenuating circumstances. Delays can be disruptive and costly to agency personnel or a contractor doing the diagnostic work.

4.3.4 Site Access

Valuable time can be lost if team members are required to obtain daily passes, are required to be escorted to the WWTP, or are prevented from using privately owned vehicles.

Suggested Action: Passes should be prearranged and issued for the entire period of the visit for both individuals and their vehicles. The requirement that an escort be provided should be avoided, if possible.

4.3.5 Use of Camera, Video Equipment, and Tape Recorder

Investigators have been prevented from using cameras, video equipment and tape recorders during on-site investigations. These recording devices are valuable in preparing reports for each phase of OMTAP.

Suggested Action: A request to use these items at the WWTP during each inspection visit should be forwarded to installation authorities prior to a visit. Permission for their use should be requested in writing, particularly at locations where strict security measures are in effect.

4.3.6 Equipment Availability

Teams have been inconvenienced when pliers and other tools were not available to install tags on valves or flow control devices.

Suggested Action: The team should bring its own tools.

4.3.7 Valve Numbering and Tagging

Assigning numbers and tagging valves can be worthwhile when the numbers are identified on the plant flow or yard-piping diagram and referred to in the O&M Manual. The actual tagging is time consuming and of questionable value, except at new plants where operators may not be familiar with the controls. In older plants, operators generally refer to valves by their function (e.g., primary clarifier valve) rather than by number. Some other factors against tagging are: tags get torn off and lost; metal tags corrode and become unreadable; plastic tags and straps fall off when they become brittle and break.

Suggested Action: Install valve tags only at new treatment plants, and in plant areas where there are complex pipe and valve arrangements.

4.3.8 Government Representation on Evaluation Team

It may be appropriate to have a government representative accompany contractor evaluation teams during on-site visits. Such a person can be an effective liaison with installation authorities, and aid investigators by obtaining information and participating in the diagnostic evaluation.

Suggested Action: Clearly define the role of the government representative during on-site visits prior to initiating the "Diagnostic Phase".

4.3.9 O&M Manual Format and Style

An O&M Manual should be easily read and understood, and should not contain unnecessary "boiler-plate" material just to increase the size of the document.

Suggested Action: Write manuals in a clear and understandable style without employing overly technical terms and involved descriptions. Also, provide site specific and detailed instructions, rather than generalized information. Reference-type materials should be provided in appendices and separately bound (ring binders) from the basic O&M Manual.

4.3.10 State Approval of O&M Manual

Some state regulatory authorities require that a copy of the plant O&M Manual be submitted and approved as part of the NPDES permit process (for instance, the Commonwealth of Virginia has this requirement). Furthermore, the content and format of these manuals are often specified by the state.

Suggested Action: These requirements should be determined by the assistance team before work begins on the manual. Preparers of the manual should be aware that, once approved, the provisions of the manual and any self-imposed standards included therein can become legally enforceable by the state.

4.3.11 Recognition for WWTP Operators

The WWTP rarely gets attention from upper-level management, until there is a major crisis. This is perceived as a lack of interest which tends to lower operator morale and incentive to perform the job well.

Suggested Action: At locations where poor morale is detected, the assistance team or the government representative accompanying the team should request a senior member from the installation engineering staff to hold exit interviews at the WWTP. In addition, a member of the engineer's staff should be requested to hand out certificates to those who successfully complete the training conducted during the Assistance Phase.

4.3.12 Training Credit

Most states require an operator to receive a certain number of hours of additional training each year in order to remain a "certified operator". Instruction given under OMTAP, during the Assistance Phase, can and should be credited against this training requirement.

Suggested Action: State regulatory agencies responsible for WWTP operator certification should be contacted by letter to request assistance in awarding training credits for OMTAP training. In the letter, cite the number of hours programmed and the subjects covered in the training. Such a request should be forwarded to the appropriate agency in each state prior to the initiation of training at any installation in that state. A typical training schedule, suggested instructor references, references and instructor resumes should accompany the letter.

4.3.13 Scope and Methods of Training

The Program of Instruction (POI) for wastewater treatment plant operators and laboratory technicians should not include formal classroom presentations covering the principles of wastewater treatment.

Suggested Action: Instruction should be semi-formal and formatted to promote dialog between the instructor and students. Over-the-shoulder, hands-on instruction should be encouraged as it

promotes better understanding and retention by students. Classes should be tailored to address those operational deficiencies uncovered during the diagnostic evaluation, and should rarely exceed 4 hours per day.

4.3.14 Exit Interviews

The exit interview is an important conference-type meeting where the results of each visit should be presented and reviewed with representatives of the installation. Often, the managers or principal officials who should attend the briefings cannot be present because of prior commitments.

Suggested Action: During or immediately after the entrance interview schedule the exit meeting for a time convenient to the officials directly responsible for the wastewater treatment plant. Key observations and recommendations should be drafted and given to the installation's engineering director by means of a one-page summary sheet.

4.4 OPERATIONAL AND MAINTENANCE PROBLEMS

4.4.1 NPDES Permit Provisions

Although most operators know that there is a NPDES permit for the plant, few ever see the formal document. Furthermore, few operators understand its provisions or the implications of this document.

Suggested Action: Include an explanation and discussion of the NPDES permit in the Program of Instruction.

4.4.2 Instrument Calibration

Important equipment such as flow recorders and laboratory instruments observed at the smaller capacity treatment plants are not periodically calibrated. Furthermore, most operators and mechanics do not have the technical ability to check or adjust such equipment.

Suggested Action: Maintenance records on control instrumentation should be examined carefully during the Diagnostic Phase to ascertain when or if the equipment has been serviced. Where it has not been calibrated for some time, encourage the use of a contractor to provide the service.

4.4.3 Infiltration and Inflow

Many military installations built in the 1940s and 1950s experience significant increases in flow at the wastewater treatment plant due to infiltration and inflow (I&I) during rainy periods. The resulting peak flows upset normal operating procedures and adversely affect unit treatment processes. Measures needed to correct such problems are very expensive, usually involving the major repair, lining or replacement of sewer lines.

Suggested Action: The on-site assistance team should try to obtain copies of plant records that show flows during period of rainfall. These data will enable the investigators to determine the magnitude of the I&I problem, but not necessarily the specific locations of the problem. Action to further define the problem and to plan for its correction generally requires flow measurements throughout the collection system followed by a detailed analysis that should be done by qualified engineers.

4.4.4 Plant Maintenance

The lack of adequate preventive maintenance on plant equipment is a common deficiency found during on-site evaluations. In most instances, there will be no formal maintenance program, no established schedule for performing designated maintenance tasks and no written maintenance records or procedures. At some locations, there will be no full-time mechanic assigned to the plant. This method of operation requires that work orders be prepared and processed in order to have mechanics from an installation maintenance shop perform the repairs. In these situations, deadlined equipment remain out of service for days, weeks or even months, if mechanics in other shops have a backlog of work.

Suggested Action: While on-site, closely examine existing maintenance conditions and procedures. As much effort should be directed to this matter as is given to investigating the treatment processes. Information obtained about the state of maintenance will determine what assistance needs to be provided during later phases (e.g., upgrading content of O&M Manual; training classes on preventive maintenance procedures; establishment of a maintenance records system).

4.4.5 Spare Parts Inventory

It is common for WWTPs to have an inadequate inventory of spare parts. In fact, there is often no record/inventory of those parts that are on hand. This condition is usually indicative of an ineffective maintenance program and symptomatic of the attitude common to military installations not spending money on the treatment plant unless it is absolutely necessary.

Suggested Action: During the on-site evaluation, examine the inventory of spare parts. In addition, inquire into the procedures used to procure spare parts and supplies for the plant. (It is not uncommon to find WWTP equipment out of service for extended periods of time due to long delays in acquiring replacement parts).

A list of essential spare parts that should be kept on hand is normally compiled from individual spares lists found in the equipment manufacturer's manual/literature. When there is no list or inventory of spare parts, the plant supervisor/foreman should be requested to prepare one without delay because a list of high mortality spare parts should be included in the plant O&M Manual.

APPENDIX I

REPORT OUTLINE

DIAGNOSTIC PHASE

COVER SHEET

PREFACE

TABLE OF CONTENTS AND LIST OF FIGURES AND TABLES

EXECUTIVE SUMMARY

- Brief outline of OMTAP
- Summary of existing plant conditions
- Key recommendations from visit
- Explanation of how NPDES permit violations may be reduced and whether permit limitations can be met with existing plant facilities
- Tentative date of Assistance Phase visit

INTRODUCTION

- In-depth description of OMTAP and date
- Purpose and date of visit, Team members, and persons visited
- Accomplishments during visit
- Installation overview: location, population, mission, next higher headquarters
- NPDES permit requirements

PLANT DESCRIPTION

- Date of original construction and subsequent modifications
- Wastewater characteristics and typical flow levels
- Design capacity
- Key processes
- Flow Schematic diagram

PLANT STAFFING AND MANAGEMENT

- Plant staffing level and organization (chart)
- Operator, mechanic and lab technician duties and work schedules
- Staff evaluation: adequacy of numbers, skill and training
- Management evaluation: manner of discharging responsibilities

PLANT OPERATION/PROCESS CONTROL

- Overview of each treatment process and process controls
- Description of plant performance and ability to meet NPDES permit limitations
- Description of plant deficiencies and operational difficulties

PLANT MAINTENANCE

- Condition of equipment
- Description and evaluation of part supply procedure and equipment repair program
- Evaluation of maintenance program and procedures

LABORATORY SUPPORT

- Description of laboratory facilities and technician capabilities
- Description of wastewater sampling and testing schedule and procedures
- Evaluation and adequacy of laboratory support operations

RECORD KEEPING

- Summary evaluation of plant records on operations, maintenance and laboratory testing
- Evaluation of record keeping procedures and record files

SAFETY

- Evaluation of Plant Safety program
- Discussion of identified safety hazards

CONCLUSIONS AND RECOMMENDATIONS

- Summary of each conclusion from diagnostic evaluation site visit
- Presentation of individual recommendations
- Estimation of the cost of implementing individual recommendations

APPENDICES

- On-Site Diagnostic Evaluation Forms (Optional)

ATTACHMENT 1
APPENDIX I

SAMPLE
DIAGNOSTIC EVALUATION FORMS
"WASTEWATER TREATMENT PLANT"

WASTEWATER TREATMENT PLANT
INSPECTION FORM

1.0 GENERAL INFORMATION

PERMIT INFORMATION

WWTP Authority/Plant _____ NPDES No. _____

Mailing address _____ Issued _____ Expires _____

_____ Effluent Limits:

Location _____ Interim _____ Final _____

Contact _____ Title _____ Phone _____

Contact _____ Title _____ Phone _____

Contact _____ Title _____ Phone _____

Consulting Engineer _____ Phone _____

VJCA Inspectors _____ Date of Inspection _____

2.0 WWTP DESCRIPTION

Level of Treatment _____ Type of Plant _____

Design Flow _____ Avg. Flow _____ Diurnal Ratio _____ Design Peak Flow _____

Current Flows: Mon-Fri _____ Sat _____ Sun _____ Peak Dry _____ Peak Wet _____

Communities Served _____ Connected Population _____

% Sep. Sewers _____ Combined _____ No. of Lift Stations _____ Sewer Const Mtls _____

I/I Problems _____ Any Bypasses ? _____

Seasonal Wasteload Variation _____

	Date	Fed Grant	Plant Description	Design Firm	Design Date
Orig. Construction					
Upgrade No. 1					
Upgrade No. 2					
Upgrade No. 3					

Recieving Stream _____ River _____ Stream Class/Use _____

Screening Disposal _____ Grit Disposal _____ Scum Disposal _____

Sludge Treat/Disposal _____

3.0 INDUSTRIAL WASTES

Major Dischargers	SIC/Activity	Flow	Waste Characterization/Pretreatment
1.			
2.			
3.			

% Organic Loading from Industrial Operations _____ Population Equivalent _____

Any Shock Waste Loads ? _____

§ 403 Pretreatment Program ? _____

4.0 PLANT LOADING AND PERFORMANCE

WWTP:

Parameter	Design Unit: ( )	Influent	Effluent	Discharge Permit 30-Day ( )	7-Day ( )	Daily Max ( )
Flow						
BOD5						
TSS						
Coliform						
pH						
Residual Chlorine						
Dissolved Oxygen						
TKN/NH3						
Total-P						
Settleable Solids						
Oil & Grease						

Are 12 Months of Operating Data Available/Attached?_____

5.0 VISUAL OBSERVATIONS

Date_____ Time_____

Process Unit	Color	Turbidity	Odor	Oil Sheen or Grease	Foam Scum or Debris	Rust or Leaks	General Hs/keep.	Comments
Influent/Headworks								
Primary Clarifier								
Aeration/Filtration								
Secondary Clarifiers								
Effluent								
Outfall Zone								
Solids Processing								
Sludge Digestion								

6.0 ANCILLARY OPERATIONS AND SERVICES

Standby Power_____ Type_____ Connected Load_____

Alarm Systems: Unit Process_____ Audible_____ Visual_____

Alarm Dispatch_____

O & M Manual: Available_____ Used_____ Updated_____

SPCC Plan_____ Emergency Response Plan_____ Fire Drills_____

7.0 WWTP STAFFING, UTILIZATION, AND TRAINING

WWTP:

Personnel Category	Staff Number		Certification	Qualifications		Staff Size		
	Total	Certified	(M) Mandatory (V) Voluntary	Education & Cert. Grade	Yrs. @ WWTP	Design	Current	Need
MANAGEMENT/SUPERVISOR								
Superintendent								
OTHER PROFESSIONALS								
Process Control Specialist								
OPERATOR (S)								
Lead Operator								
Shift Supervisor								
Operator								
LABORATORY								
Manager/Chief Chemist								
Chemist								
Technician								
MAINTENANCE								
Mechanical								
Electrical								
Laborer								
OTHER PLANT PERSONNEL								
Office								
State/Fed. Certification System: _____ lowest to _____ highest					TOTAL			

STAFF UTILIZATION

Shift	Weekdays				Weekends			
	OPS	MNT	LAB	TOT	OPS	MNT	LAB	TOT
Days_____ to_____								
Eves_____ to_____								
Nights_____ to_____								
Yearly Labor Turnover								

Collection System Responsibility YES NO

Lift Station Responsibility YES NO

TRAINING

Encouraged _____ Utilized _____

Cert. Upgrade Bonus _____

Local Schools _____

State/WPCF Conf. _____

Start-Up _____ In-Plant _____

Expenses Paid _____ Annual Budget _____

8.0 MAINTENANCE PROGRAMS

WWTP: _____

Is Preventive Maintenance Practiced: _____ P.M. Manager _____

Describe Formal P.M. Program: _____

Equipment Records Kept? _____ Maintenance Log Maintained? _____

Manufacturers O & M, Specs On-Site? _____ Equipment Shop Drawings? _____

Describe Spare Parts Inventory _____

Describe Inventory Control and Security _____

Adequacy of Maintenance Shop and Facilities _____

Major Equipment/Tools _____

Equipment Desired/Needed _____

Staff Size: Day _____ Evening _____ Weekend _____

Electrician Capabilities _____

Instrumentation Calibration: Who _____ Frequency _____

Grounds Maintenance _____

General Housekeeping _____

Seasonal/Part-Time Help _____

Contract Maintenance/Repair _____

Adequacy of Safety Equipment _____

9.0 MONITORING LOCATIONS, FLOW MEASUREMENT and LAB TESTS

WWTP:

Parameter	Frequency of Monitoring (days/weeks)									NPDES Requirement			Analytical Protocols				
	Raw Influent	Degritted Influent		Primary Effluent	MLSS/MLVSS	RAS/TF Recirculation		Secondary Effluent		Final Effluent	Raw Sludge	Stabilized Sludge	Test Mtd	QA/QC			Notes
														Blanks	Reps	Spiked	
BOD 5																	
TSS																	
pH																	
Coliform																	
Residual Cl2																	
TKN/NH3																	
Total-P																	
Dissolved O2																	
Oil & Grease																	
COD																	
Sep. Solids																	
Vol. Solids																	
Sample Type													QA/QC Manager				
Flow Metering Instantaneous													Chain-of-Custody				
Totalizing													Date Balance Last Serviced				
Recording													Due Date:				

Certified Lab: Water _____ Wastewater _____ Inter-Lab QA/QC _____

Lab Worksheet Storage (yrs) _____ Frequency _____

Is Data Graphed _____ Sample Types _____

Flow Meter Type _____ Lab Name _____

Meter Calibration _____ Last _____ EPA/State Sample Tests _____

Anal. Bal. Calibration _____ Last _____ Level of Results _____

Sample Types

Number _____ How Set? _____ How Cleaned? _____

10.0 COMMERCIAL/CONTRACT LABORATORY SERVICES

Lab Name _____ Analytical Tests _____

Address _____ Frequency _____

Lab Name _____ Analytical Tests _____

Address _____ Frequency _____

11.0 LABORATORY EQUIPMENT INVENTORY

WWTP:

Instrumentation/Unit	Manufacturer/Brand	Quantity	Frequency of Lab Use	Estimated Age	Condition
Balance, Analytical/Beam					
Centrifuge					
Drying Oven_____°C					
Muffle Furnance_____°C					
Digital Balance					
DO Meter and Probe					
pH Meter and Probe					
_____ Meter and Probe					
Turbidity Meter					
Spectrometer					
Six-Paddle Stirrer					
COD Distillation					
TKN Distillation					
Soxhlet Apparatus					
Refrigerator					
Incubator, 20°C					
Water Bath, 45°C					
Autoclave/Sterilizer					
Microscope/Stereoscope					
Water Still					
Ice Maker					
Dishwasher					
Automatic Sampler					
Atomic Adsorption (AAU)					
Fume Hood					
Eyewash/Emergency Shower					
Fire Extinguisher					

EQUIPMENT MAINTENANCE CONTRACTS:

Equipment_____ Maint. Rep._____ Fequency_____ Last_____

Equipment_____ Maint. Rep._____ Fequency_____ Last_____

UNIT PROCESS SUMMARY SHEET

Schematic

OPERATING & DESIGN CHARACTERISTICS:	
Type/Number/Demensions/ Volume	
Capacity Rating	
Equipment	
Manufacturer	
Type	
Size	
Control	
Equipment	
Manufacturer	
etc.	

* Influent Structure
Grit Gremoval
Flow Measurement

Primary Ttreatment
Trickling Filter
Secondary Clarifier

Disinfection
Sludge Digestion
Sludge Drying Beds

APPENDIX II

SAMPLE OUTLINE

O&M MANUAL

CHAPTER **1.0** **INTRODUCTION**

1.1 Type of Treatment
1.2 Major Treatment Plant Units
1.3 Operator Responsibility
1.4 Operator Training and Selected Course Titles
1.5 Suggested Periodicals
1.6 Management Responsibility

CHAPTER **2.0** **PERMITS AND STANDARDS**

2.1 Critical Discharge Permit Information
2.2 Water Quality Standards
2.3 Spill Response Procedures
2.4 Installation Spill Response Team

CHAPTER **3.0** **DESCRIPTION, OPERATION, AND CONTROL OF WASTEWATER TREATMENT FACILITIES**

3.1 Preliminary Treatment
3.2 Primary Treatment
3.3 Trickling Filter
3.4 Secondary Clarification
3.5 Disinfection
3.6 Chemical Feed System

CHAPTER **4.0** **DESCRIPTION, OPERATION, AND CONTROL OF SLUDGE HANDLING FACILITIES**

4.1 Sludge Pumping
4.2 Sludge Digestion
4.3 Sludge Dewatering

APPENDICES

A. Glossary of Terms
B. NPDES Permit
C. State Regulations
D. Installation Spill Contingency Plan
E. Wastewater Treatment Plant Design Criteria
F. Schematics/Drawings
G. Valve Indices
H. Equipment Suppliers
I. Manufacturer's Equipment Literature
J. Sources for Service and Parts
K. Major Equipment List
L. Spare and Replacement Parts
M. Standing Operating Procedures
N. Special Tools and Equipment
O. Chemicals Used in Plant
P. Laboratory Chemicals
Q. Piping Color Codes
R. Painting
S. Lubrication
T. Federal and State Reporting Forms
U. Sample Forms
V. References
W. Miscellaneous

APPENDIX III

REPORT OUTLINE

ASSISTANCE PHASE

COVER SHEET

PREFACE

TABLE OF CONTENTS AND LIST OF FIGURES AND TABLES

EXECUTIVE SUMMARY

- Brief outline of OMTAP
- Highlights of Diagnostic Phase actions
- Highlights of training classes
- Summary of changes in plant conditions
- Key recommendations

ASSISTANCE PHASE SUMMARY

- Purpose and date of visit
- Team members, persons visited and accomplishments during visit
- Training activities
- Summary of Team observations
- Summary and status of Diagnostic Phase recommendations

CONCLUSIONS AND RECOMMENDATIONS

- Summary of each conclusion from Assistance Phase site visit
- Presentation of new recommendations
- Estimate of the cost to implement each new recommendation

APPENDICES

- Actual training schedule
- List of participants
- Instructor resumes

APPENDIX IV

REPORT OUTLINE

VERIFICATION PHASE

COVER SHEET

PREFACE

TABLE OF CONTENTS AND LIST OF FIGURES AND TABLES

EXECUTIVE SUMMARY

- Brief outline of OMTAP
- Highlights of Diagnostic and Assistance Phases
- Status of previous recommendations
- Changes in plant conditions and personnel
- Key OMTAP recommendations
- Primary OMTAP

INTRODUCTION

- Description of OMTAP
- Explanation of Verification Phase site visit-Team members, date, persons visited
- OMTAP Team activities
- Summary of Team observations on plant improvements

DIAGNOSTIC PHASE SUMMARY

- Summary of site visit
- Significant observations of OMTAP Team Diagnostic Phase recommendations

ASSISTANCE PHASE SUMMARY

- Summary of site visit
- Significant observations of OMTAP Team
- Summary and status of Assistance Phase recommendations

VERIFICATION PHASE

- Purpose and date of visit
- Team members, persons visited and accomplishments during visit
- Observations of OMTAP Team
- Verification Phase conclusions and recommendations with cost estimate for implementing recommendations

PROGRAM SUMMARY

- Summary of OMTAP goals and accomplishments
- Benefits of OMTAP e.g., improved efficiencies, improved performance, cost savings, etc.
- Lessons learned

APPENDICES (as required)

APPENDIX V

APPENDIX V

STATEMENT OF WORK

OPERATION, MAINTENANCE AND TRAINING

ASSISTANCE PROGRAM (OMTAP)

BACKGROUND

Since the early 1970's, millions of dollars have been spent to improve the performance of wastewater treatment plants (WWTP) in accordance with USEPA regulations promulgated under the provisions of the Clean Water Act. Specific actions taken to date have included the design and construction of new or upgraded treatment plants in order to meet the effluent limitations prescribed in the NPDES permit for each plant. Despite previous measures taken to improve wastewater treatment plants, these efforts have not been completely successful.

This finding was announced in a 1984 GAO audit report of DOD wastewater treatment plants, and was followed by a recommendation by GAO to improve plant operation and maintenance.

OMTAP OBJECTIVE

Improve the overall performance of each WWTP operated by a military service for the purpose of achieving continuing compliance with applicable Federal or state effluent standards and at the lowest practicable cost.

TASKS

The following tasks are to be performed under OMTAP. A checklist of the actions involved in each Task is an attachment to this Statement of Work.

1. DATA COLLECTION PHASE

In order to devote the maximum time available for on-site diagnostic investigation, obtain and review the following documents containing information on selected WWTPs prior to visiting the plant. (Sufficient time should be scheduled to request and receive copies of the following document from the installation(s) selected for evaluation).

1. NPDES Permit and Reporting Forms
2. Plant Flow Diagram
3. Plant O&M Manual
4. Plant SOPs
5. State Reporting Forms
6. EPA, State and other Plant Evaluation Reports
7. Other Pertinent Documents

2. DIAGNOSTIC PHASE

Conduct an on-site diagnostic evaluation of the designated WWTP and determine what site-specific assistance is needed to correct observed deficiencies. To achieve this objective, perform the following tasks:

Task No.	Description
2-1	Evaluate the performance of each unit process in the treatment system.
2-2	Evaluate operator performance of routine tasks, as identified in existing SOPs or available O&M Manual.

2-3	Evaluate existing records and reports on plant performance to determine compliance with NPDES permit effluent limitations. Conduct confirmation wastewater quality tests, if necessary.
2-4	Evaluate the adequacy of existing operating documents, to include plant flow diagram, SOPs and O&M Manual. Where needed, number and tag each valve and flow control device to correspond with an identification shown on the flow diagram and for possible identification and reference in the O&M Manual.
2-5	Evaluate the adequacy of wastewater sampling procedures and the laboratory testing of these samples. In addition, verify the adequacy of the procedure used for recording test data and the methods used in the preparation of prescribed reports.
2-6	Evaluate (1) the existence of a management structure (2) adequacy of plant staffing, grade structure and promotion opportunities, (3) extent of operator training, (4) number of certified operators and (5) the morale of WWTP employees.
2-7	Evaluate the adequacy of safety equipment and safety procedures (SOP). Include fire and accident prevention, and emergency medical assistance.

2-8	Evaluate the effectiveness of plant housekeeping and equipment maintenance, and the responsiveness of procurement procedures for repair parts and consumable supplies.
2-9	Provide verbal instructions and/or demonstrate any procedural changes to current operations that will immediately correct observed deficiencies, if appropriate.
2-10	Compile a diagnostic report which briefly describes the WWTP as designed and currently operated, which describes design and operational deficiencies, and recommends any corrective measures to overcome the deficiencies. If structural or equipment modifications are needed, provide an estimated cost and suggested implementation schedule for consideration.
2-11	Prepare a draft of a new or an upgraded plant O&M Manual, to include: an accurate treatment flow diagram; site-specific maintenance procedures; site-specific wastewater sampling; testing and reporting; and plant safety procedures.

2-12	Prepare a Program of Instruction (POI), Lesson Plans, Training Aids and Student Handbook for operator and laboratory technician training classes that will correct any operational, preventive maintenance and skills deficiencies described in the diagnostic report (task 2-10).

3. ASSISTANCE PHASE

After conclusion of the Diagnostic Phase, approximately 60-90 days, revisit the WWTP for the purpose of providing assistance as outlined in the following tasks:

Task No.	Description
3-1	Conduct training classes for all WWTP operators and/or laboratory technicians in accordance with an approved POI (see task 2-12).
3-2	Validate the contents of the draft O&M Manual through on-site review and discussions with the plant foreman and/or operators.
3-3	Reevaluate plant operation to assess improvements made since initial visit.
3-4	Prepare a "Report of Visit" describing the scope and results of the training effort, findings on new deficiencies, and results of validating the O&M Manual.

3-5	Supply copies of self-study training texts for use by WWTP personnel.

4. VERIFICATION PHASE

Approximately 6-9 months after completion of the Assistance Phase on-site training, revisit the WWTP to assess the extent of improvements made in plant performance as result of prior inspections. The work involved is described in the following tasks:

Task No.	Description
4-1	Obtain and review documents and data records reflecting changes to plant equipment and operating procedures prior to scheduling an follow on-site visit.
4-2	Conduct an on-site WWTP diagnostic evaluation to evaluate the extent of improvement to the operation and maintenance of the plant. Activities to be included in this investigation are those previously covered during the Diagnostic Phase. Primary attention is to be directed to verifying compliance with prescribed effluent standards and submission of accurate and complete reports to regulatory agencies.
4-3	Prepare a report of "Verification Visit" which summarizes the status of investigative findings and presents additional recommendations, if any.

4-4 The manager of the OMTAP may exercise the option to conduct an additional follow-on verification visit at a date to be specified, if conditions warrant.

ATTACHMENT
APPENDIX V

OMTAP CHECKLIST

A. DATA COLLECTION PHASE

NO.	ITEM	YES	NO
1.	NPDES Permit and Reporting Forms		
2.	WWTP Flow Diagram(s)		
3.	WWTP O&M Manual		
4.	WWTP SOP(s)		
5.	EPA, State and other plant evaluation reports		
6.	QA/QC documents or reports		

B. DIAGNOSTIC PHASE

PREVISIT REQUIREMENTS:

	NO.	ITEM	YES	NO
Supplies/Equipment Required	1.	Blank Diagnostic Forms		
	2.	Valve Tags and Ties, pliers		
	3.	Camera (optional)		
	4.	Tape Recorder (optional)		
	5.	Tape Measure		
	6.	Writing Supplies		
Actions Required	7.	Confirm Receipt of Data Requested		
	8.	Confirm Date/Time for Initial Interview		
	9.	Verify Need for Individual/Vehicle Passes		
	10.	Request Permission to Use Cameras/ Recorders		

ON-SITE ACTIONS:

Interview	1.	Team Entrance Interview		
Personnel	2.	Table of Distribution and Allowances (TDA) and Job Descriptions		

ATTACHMENT
APPENDIX V

	NO.	ITEM	YES	NO
	3.	Manning and Grade Levels		
	4.	Shift Schedule		
Training				
	5.	Operator Training (courses completed)		
	6.	Laboratory Technician Training (courses completed)		
	7.	Operator Certificates currently in effect		
Plant Operation				
	8.	Plant As-Built Drawings		
	9.	Operator Logs		
	10.	Daily Operation Checklist		
	11.	Reported Data (Effluent) (latest 12 months period)		
	12.	Operating/Laboratory Record Keeping Procedure		
	13.	Plant Bypass Procedure		
	14.	Sludge Disposal Procedure		
	15.	Management Interview		
	16.	Operator Interviews		
	17.	Investigative Team Sampling and Testing (if Required)		

ATTACHMENT
APPENDIX V

	NO.	ITEM	YES	NO
Safety (Fire and Accident)				
	18.	Safety SOPs/Records		
	19.	Safety Equipment List		
	20.	Hazardous Chemical Storage and Handling Plan		
	21.	Hazardous Substance Spill Contingency Plan		
	22.	Radio Communications		
Laboratory				
	23.	Laboratory and Plant Sampling Equipment List		
	24.	Laboratory and Plant Test Equipment List		
	25.	QA/QC Plan (if not available in data collection phase)		
	26.	Sampling and Laboratory Testing Procedures		
Maintenance				
	27.	Maintenance SOP and Schedule		
	28.	Equipment Deadline History		
	29.	Repair Parts Inventory, and Procurement Procedure		
	30.	Chemical Stockage and Procurement		

	NO.	ITEM	YES	NO
	31.	Tool List		
	32.	Available Contract Maintenance and Repair Services		
Health				
	33.	Annual Physical Exam		
	34.	Sanitary Eating Facilities		
	35.	Individual Lockers		
	36.	Adequate Lavatory Facilities		
	37.	Laundry Facilities		
Utilities				
	38.	Primary Power Sources		
	39.	Emergency Power Sources		
	40.	Telephone Service (Office and Plant Area)		
	41.	Types(s) and Sources(s) of Fuel		
Interview				
	42.	Team Exit Interview		

POST VISIT ACTIONS:

1.	Compile Diagnostic Report	
2.	Prepare/Upgrade O&M Manual	

ATTACHMENT
APPENDIX V

NO.	ITEM	YES	NO
3.	Develop Training Plan/Program Of Instruction (POI) Training Aids		
4.	Prepare Student Handbook		
5.	Prepare QA/QC Plan (if required)		

C. ASSISTANCE PHASE

PREVISIT ACTIONS:

NO.	ITEM	YES	NO
1.	Completed Draft O&M Manual		
2.	Completed Training Plan and POI		
3.	Completed Training Aids		
4.	Completed Student Workbook		
5.	Completed Examinations		
6.	Completed Critique Sheet		
7.	Copies of Selfstudy Training Texts		

ON-SITE ACTIONS:

1.	Prepare Classroom
2.	Compile Trainee List
3.	Conduct Training Class
4.	Score Examinations
5.	Complete Critique Sheet
6.	Validate O&M Manual
7.	Team Exit Interview

ATTACHMENT
APPENDIX V

POST VISIT ACTIONS:

NO.	ITEM	YES	NO
1.	Prepare Report of Visit to Include Training Evaluation		
2.	Report Training Results to State for CEU Credit		

D. VERIFICATION PHASE:

PREVISIT REQUEST:

NO.	ITEM	YES	NO
1.	Documents on Equipment/Plant Changes		
2.	Revised Operating Procedures		
3.	Amended NPDES Permit (if applicable)		
4.	Copy of Reported Data (last 12 month period)		

ON-SITE ACTIONS:

1.	Team Entrance Interview		
2.	Identify Organization/ Personnel Changes		
3.	Actions to Date on Reported Deficiencies.		
4.	Revalidate O&M Manual		
5.	Verify Changes to Safety Procedures		
6.	Verify Changes to Maintenance Procedures		
7.	Verify Changes to Supply/ Parts Procurement Procedures		

ATTACHMENT
APPENDIX V

NO.	ITEM	YES	NO
8.	Verify Changes to Sampling/ Testing Procedures		
9.	Team Exit Interview		

POST VISIT ACTIONS:

1.	Prepare Report of Visit		
2.	Prepare Revisions to O&M Manual (if required)		
3.	Schedule Follow-On Verification Visit (if required)		